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FIVE CENTS



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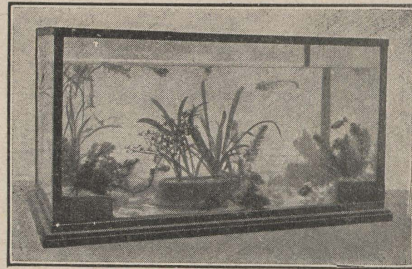
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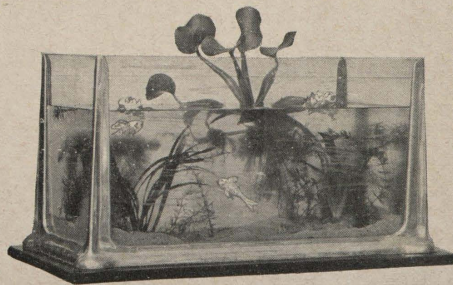
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THE AQUARIUM BULLETIN

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The Aquarium Bulletin

Published monthly in the interest of the scientific
study of aquaria and allied subjects by

The Brooklyn Aquarium Society, Inc.



The Spring Peeper

(*Hyla Pickeringi*)

By RICHARD DECKERT, of the New York Zoölogical Society.

The Spring Peeper, *Hyla Pickeringi*, is a pretty little species, and the readers of THE AQUARIUM BULLETIN no doubt are familiar with its shrill piping notes, issuing from ponds, woods and roadside ditches in March and April. It is the first Amphibian to come from its hibernating quarters. Its size is one to one and one-quarter inches, and the colors are usually some shades of brown, with a dark cross on its back. This species has not the power to change its color, only being able to take on lighter or darker shades of brown.

The third species of tree-toad found on Long Island, belongs in a different genus, and is known as the Cricket

Frog from its call, which resembles that of an insect rather than a frog. *Acris geyllus* is the technical name of this little creature, which frequents the low vegetation on the borders of ponds and lakes. It is a shy and active frog, seeking protection among arrowheads and lily leaves at the slightest sign of danger. Its coloration serves to conceal it here, but, being very active, it can soon be seen, hopping about again.

It is a very voracious feeder and can swallow insects of astonishing size, considering its own diminutive self. The size is three-quarters to one and one-eighth inches, it being the smallest frog of the northeastern

United States. In captivity it should have roomy quarters; otherwise it is liable to injury, owing to its habit of jumping with great force against the sides and covering of its cage. The colors are brown, with a bright green mark between the eyes, along the back to the vent. On the sides are two large triangular black patches. These sometimes have several large elongate red warts. The limbs are gray or brown with darker cross-bands. The throat of the male is lemon-yellow and can be expanded into a large, round vocal sac. This ability it shares with all members of the family Hydridæ.

There are a dozen other species of Tree Toads in the United States — some of which can sometimes be bought at aquarists' stores — and which make interesting and beautiful terrarium inmates. I will describe some of these in another BULLETIN number in the near future.

(*Photo by Dr. F. Overton)

Has Anyone Kept *Labeo*?

By JOHN TREADWELL NICHOLS
Amer. Museum of Natural History,
New York.

Carp-like fishes form the largest group of fresh water species in the world. A notable division of this group is the suckers, which, except for a couple of species in Eastern Asia, are strictly North American. many of us have kept small suckers in aquaria and their manners and in aquaria, and their manners and habits are well-known.

In Africa there is a genus of carps resembling suckers on account of the peculiar structure of its mouth, which

is really more closely related to *Barbus* species, some with beautiful colors, others with elongated fins. One with a minute eye brought back by the American Museum of Natural History's Congo Expedition probably has interesting and peculiar habits. Species of *Labeo* are found in Southern Asia as well as Africa. It would be most interesting to compare their habits with those of the suckers, but we have never seen one in an Aquarium. *Labeo* is really more closely related to *Barbus* than to the suckers and would doubtless do well in aquaria. Who will be first to keep them?

The Children's Museum Aquaria

What They Have Taught the Children
About Snails

By MISS CHRISTINE RUTH,
of the Children's Museum, Brooklyn.

The actively swimming fish in the Children's Museum Aquaria catch the attention of many small visitors, who stand and watch them with great interest. As they follow the motions of the fish, the children notice that there are some other living creatures in the aquarium. Down in the gravel there is a dark, rounded lump; on the glass sides there are some flat, gray disks surmounted by dark lumps like the one on the bottom of the aquarium. The gray disk begins to crawl along, carrying the lump with it, and the children learn that this queer animal is called a snail, a name which they have heard but have never been able to apply before. They are told that the one they are watching is a Japanese Water Snail.

Having discovered a new animal, the children are curious to learn all

they can about it. By watching it slide along the glass, they learn that the gray disk is the only foot the snail possesses. They wait for more of the body to be protruded from the round shell, but all they can see above the foot is a peculiar elongated head. They watch the mouth opening laterally at the end of the proboscis and they often ask for a magnifying glass in order to observe the ribbon-like tongue more closely as it darts out and rasps away the algæ from the glass.

This action of the snail explains its presence in the aquarium, for the children soon learn that it plays a very useful role of scavenger.

The motions of the sluggish big Japanese Water Snail conform to the children's preconceived notions of a snail's slowness. They are all the more amazed then when they see how rapidly and easily the pointed foot of the tiny pond snail glides up the glass sides of the aquarium, carrying its owner above the water where it can breathe the air. The Japanese Snail never does this, and the young students notice that it has a tube opening on the side of the body, above the foot—something that the pond snail lacks. They learn, through their reading and asking of questions, that the former has a gill and gill-opening and can therefore breathe under water, while the pond snail must breathe air into its lungs as we do.

They see how the snail pulls in its tentacles and its foot when a fish approaches too close. They discover that the Japanese snail has an operculum of concentric rings of lime, with which to close the shell opening, but they cannot find any on the pond snail. Their search for an operculum

on the Red Snail is fruitless, too.

In looking at the aquaria containing red snails and pond snails, the children sometimes see the little masses of jelly containing eggs, attached to the plants or pressed against the glass. They have watched the embryo snails develop inside the jelly, and have seen them gradually acquire their tiny transparent shells. After noting the sudden arrival of the young Japanese snails in the aquarium without the presence of eggs before hand, the children have learned that these snails are live bearing.

The fact that red snails are always bred in aquaria which do not contain fish emphasizes the fact that the baby snails would be a delicate morsel for the fish if left to their mercy. The children have noticed too, from these breeding aquaria that the young snails enjoy eating lettuce.

A boy who has been studying minerals happened to put a drop of acid on a snail shell one day, and was startled by the discovery that it effervescenced, or "fizzled" as he said, just like limestone under similar circumstances. It did not take him long to realize after this instance that all molluscs derive the material for their shells from the lime dissolved in water, and that for this reason bits of shell are placed in aquaria with growing snails so that they shall not lack building material.

From their observations of the snails in the aquaria, the children have learned of one of the factors in balancing an aquarium. But they have learned more than this, for their eyes are opened to the habits and structure of a new type of animal which they would otherwise not have been able to study from living specimens.

On the Comparative Osteology of Some Bermuda Fishes

By DR. R. W. SHUFELDT
Washington, D. C.
PART I.

While a resident of New York City, during the autumn of 1907 up to early spring of 1909, I prepared a number of skeletons of various forms of teleostean fishes. I observed at the New York Aquarium that the tanks there were supplied in the main by fishes transported alive from Bermuda, and also by some few species captured in New York Harbor and elsewhere. Many of the Bermuda fishes died during transportation, and numerous others died from time to time in the aquaria.

A large number of these fish were thrown away; others were fed to living forms in the aquaria that would eat them; some few were saved in spirits; and finally, students of ichthyology occasionally utilized the remaining few. In so far as their osteology was concerned, many of these fish would well repay examination and description, and I therefore suggested to Dr. Charles H. Townsend, the Director of the Aquarium, that I be permitted to prepare skeletons of any of those fish that died under circumstances just pointed out, with the view of describing and comparing their skeletons. To this proposition he readily assented, and a suitable room was set apart for me at the Aquarium, in which I could carry on such work. For this favor I have to thank Dr. Townsend in particular, who not only gave me the opportunity to prepare the material here to be described, but for the unusual facilities he extended

to me during the entire time I was engaged upon it at the Aquarium. My thanks are also tendered to Mr. Robert Sutcliffe, his Secretary, for the ready assistance he was to me upon all occasions in looking after my interests, as well as to others connected with the institution. My thanks in general are due to the New York Zoölogical Society, under whose jurisdiction the Aquarium is, for the gift of the specimens I used, and the permission to retain the skeletons I prepared.

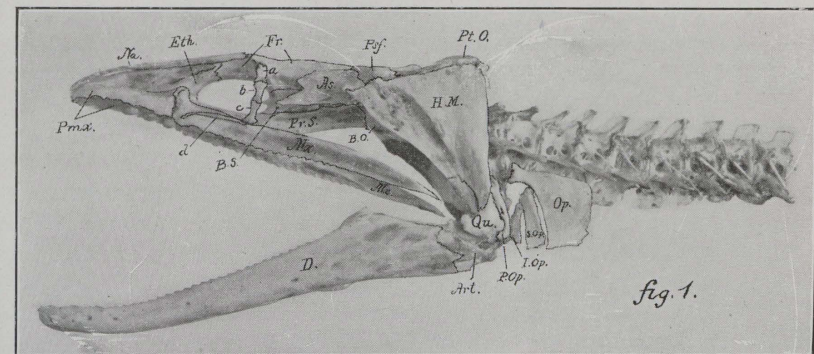
The drawings and photographic plates illustrating the present contribution were all prepared by myself, without assistance from anyone. They are direct from the specimens, and descriptions of them given in their proper places. As all the forms, from which I obtained skeletons, are described, in so far as their topographical characters are concerned, in numerous works on the science of ichthyology, and probably every one of them figured, in fact some of them numerous times, I shall here omit all such data. Nor is it my intention to enter into the synonymy of the species, as that is equally accessible to students of the subject. Where the skeletons have been described by other authors, and their works are known to me, such facts will be noted; while it is by no means my intention to present an exhaustive list of the literature covering any or all of the species examined, as such labors have already been very thoroughly performed by others;

moreover, space forbids. It may be taken for granted that I am familiar with most of the standard works, which have anything to do with the osteology of fishes, and also a large part of the memoirs on the subject. My personal library contains many of both of these, and all are easily accessible. Some of my skeletons are ligamentous ones; some are perfect in all respects; some are roughed out; while, finally, the majority of them are disarticulated, and in excellent condition for study. A complete list of those I made at the New York Aquarium is given below,

their descriptions published in various places.

NOTES ON THE SKULL OF THE SPOTTED MORAY (*Lycodontis moringa*)

Both young and adult morays, usually the Common spotted Moray (*Lycodontis moringa*), have, from time to time, thriven well in the tanks at the Aquarium. Often they have been of large size, but none of these died during my stay there, and consequently no skeleton of such a one is found in my collection. On one occasion the



the Bermuda fishes being kept together, and presented in any orderly manner for convenience of consultation. To this list is appended another list, in which appears other specimens obtained from the same source, together with a small collection, for which my thanks are due to Dr. Francis B. Sumner, who selected them for me from the collections at the Laboratory at Woods Hole, Massachusetts, and donated them for the present purpose. In this list also occur a few other skeletons of fish I find in my private collection, which I have made at different times. Some of these have already been described by me, and

head of a sub-adult *Lycodontis moringa* was preserved for me, and from it I prepared the skull and some of the associated parts. Most of the teeth were lost. Later on I made a photograph of this specimen (Fig 1), and, as it is of some value, a brief description of it is given here. Doctor Theo. Gill kindly examined the specimen and my photograph, and suggested that comparisons should be made with quite a number of other fishes, more or less nearly related to it; but to extend the present work in such a way, would carry me far into a study of the comparative osteology, not only of all the various available forms of the

Muraevdae, but the *Ophichthyidae*, the *Anguillidae*, the *Leptocephalidae*, and no end of others, which would soon lead one far away from the fishes of Bermuda; defeat the object of the present paper, and result in the entering upon a task of a lifetime.

However, I followed Dr. Gill's most valuable suggestions as far as I could, and to the extent of making certain dissections of the heads of young eels (*Anguila chrysypa*), for specimens of which I am indebted to Mr. Barton Bean, Curator of the Department of Fishes of the U. S. National Museum; of examining the work of F. A. Smitt on Scandinavian Fishes, and others, which are cited beyond, and copying by photography and otherwise a number of figures from the same, which, as cuts, are here reproduced in figures 2-12, and duly acknowledged. Further than this it did not seem expedient to pursue the subject of the osteology of all the APODES known to science, valuable as such a contribution might be made to be.

Doctor Ficalbi Eugenio's work on the skulls of Italian murænoids, here cited in full in a note preceding figure 3, is in Italian, and a valuable contribution to the subject, which has been read by me with care. Doctor Eugenio in this paper makes a comparative study of the skulls of an Eel, a Conger Eel, a Marine Snake and a Muræna. He points out what Parker has given us on the skull in the last-named genus and its nearest allies, thus "In the Murænoids the trabeculae become merely narrow bands of cartilage in the orbital region, arched forwards and upwards upon the parasphenoid. Anteriorly there is a median vertically crested ethmoidal bone, deeply grooved beneath to receive a high

crest from the dentigerous vomer. On either side of this crest lies a distinct simple trabecular rod. The olfactory nerves, as they pass to the nasal sacs, are enclosed by a pair of thick separate ectoethmoidal cartilages; above the membranous olfactory capsule is a small nasal bone. There are no premaxillaries; the vomer, dentigerous all the way, runs to the anterior extremity of the beak; the maxillaries are large and dentigerous. The hyomandibular is very large, with two distinct heads widely separated; its distal part is directed downwards and forwards; the symplectic is distinct. Between these two bones the rest of the hyoid arch is attached by the interhyal ligament, being embraced by splint-like processes of bone from the hyomandibular. There is a rod-like quadrate, and in front of it a minute, triangular process of cartilage—all the pterygoid that exists; above, there is a styloid palato-pterygoid bone. The lower jaw possesses, besides dentary and articular, a small, thick coronoid on the inner face, wedged between the two larger bones."

This rather full quotation from Professor Parker is of value here as a ready means for comparison of the characters of the skull and associated parts of the murænoids in general, with what is to follow.

Dr. Eugenio's paper is an extensive one, and the comparisons he makes are very thorough; so it will only be referred to in the matter of special points as they occur. I intend to reproduce his instructive figures, drawn from his plates by myself; they are valuable for comparison with Fig. 1. (This interesting article with added illustrations by the author will be continued in the January number)

The Colors of Fishes

By DR. F. A. LUCAS

Director, Amer. Museum of Natural History, New York.

In the August BULLETIN Mr. Chapin tells of his experiences with a pair of shunbunkins, which varied in color according as they were placed in a white bath tub or in their balanced aquarium. His article concludes by asking, "If the whiteness of the tub did cause the colors of my fish to change so greatly, just what change was produced in the coloring matter in the fish? And if white surroundings cause the color to fade, what effect would other colors have on the color of the fish?"

Before replying to these questions, which are direct and to the point, let me say that it is not surprising that even fish should turn color when called shunbunkins. To paraphrase Senator Slotes' remark about the dodo, "I don't know what a shunbunkin is, but I know it's something nasty."

Apparently Mr. Chapin is not an angler or he would long ago have noted how fish vary in color with their surroundings, the familiar little perch being dark and richly colored in muddy, weed-grown waters and quite pale in clear ponds with sandy bottoms. Even such bottom haunting fishes as catfish and eels vary greatly—eels in the Potomac River, where the water is shallow, being of a most beautiful golden green. The common killifish, or mommichog, has several distinct color phases and may be readily made to assume them promptly by placing them in dishes of various colors. Tropical fishes shown at the New York Aquarium vary almost from minute to minute, flushing and paling with excitement, fear or anger, like

so many human beings. These changes in color have attracted considerable attention among naturalists and in the last year or two have been the object of careful study by S. O. Mast and Albert Kuntz under the auspices of the Bureau of Fisheries. The fishes experimented with were two species of flounders that proved particularly adaptable, became accustomed to being handled and almost showed a knowledge of what was wanted of them, for after awhile they changed color much more rapidly than they did at first. Incidentally they became so accustomed to life in an aquarium that when put back in the sea they did not "know enough" to go out as the tide fell, but allowed themselves to be left high and dry, and as the famous tame trout was drowned by falling into the water, so these perished by being given the freedom of the seas.

Doctor Kuntz found that the simpler changes in color, from light to dark, and dark to light, were brought about by changes in dark pigment, varying from brown to black, contained in minute cells with many radiating branches, something like a star with many points. When placed on a light background the color ran down the arms towards the center, and the cell itself sank deeper into the skin, this removal of pigment from the surface making the fishes lighter in color: a reversal of the process caused the fishes to grow darker. These are the very simplest color changes that took place in the flounders and that take place to a greater or less extent in most fishes, but there are others much

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more extraordinary; for example, the flounders became plain or mottled and even yellow or green according to the pattern and color of the ground on which they were placed.

These changes are due to the presence of two other sets of cells—one containing color grains that vary from yellow to orange, and the other crystals of a substance termed guanin, that are grayish in color, the mixture of these in varying proportions giving the range of colors noted. These changes are brought about automatically through the action of the nervous system set in motion in response to the effect of color or pattern on the eye. This is a very rough-and-ready explanation of the simpler color changes, but anyone interested in the subject will find the papers on which these notes are based in any large library and certainly in any museum li-

brary.

Such color changes as take place in gaudy tropical fishes with their vivid reds, yellows, blues and greens are more complicated and less is known about them owing to the difficulties of studying them. Not all fishes are as quiet and good natured as were the flounders.

Roughly speaking, however, these colors seem to be due to color cells, chromatophores, of two or three kinds, the variation in color being due to the presence or absence of such cells, to varying combinations of these, and to the extent to which the cells are, so to speak, opened or closed. For example, if all cells were closed, we would have a gray such as we see in some of the groupers, and an opening and closing of the red cells would make the fish flush, as he may be seen to do at the Aquarium. Yellow or orange and brown or black would give a great range of greens, and other combinations would give still other colors.

The silver sheen of some fishes and the iridescence of others are due to other causes — and that is another story.

**Preserving Prepared
Fishfoods**

By WM. T. INNES.

Insects and their larvæ are the principal enemies of dry fishfoods. In some extraordinary manner these pests manage to get a footing in the food if it is left uncovered for short periods. With such foods as air-dried shrimp it is not surprising that the eggs of small flies should already be deposited before we get the shrimp, but many fishfoods are baked in the

(Continued Page 75, Col. 2.)

OFFICIAL SOCIETY NOTICE.

MEETING OF DECEMBER 11, '17

Owing to the fact that there will be no meeting on the fourth Tuesday of December, due to proximity of the Holiday Season, Tuesday evening, December 11th, will be the last gathering for 1917.

This alone, not to mention other events scheduled should induce members to drop the laxity and indifference shown by some recently, and evidence an interest in the affairs of THEIR Society.

HOW ABOUT IT

It should not be hard to remember the SECOND and FOURTH Tuesdays each month and keep them for THE BROOKLYN AQUARIUM SOCIETY, Inc., nor would it require much time to encircle in advance these dates on your calendar for all 1918.

Nominations for Officers for 1918 will be submitted and following the usual routine business, which will be limited, the remainder of the evening will be devoted to a Social Entertainment. Mr. C. H. Chapin is in charge of this affair and he requests everybody to be on hand by 8:15 at least.

dress on aquatic plants.

The Essex County Aquarium Society is desirous of turning over to our organization the cup awarded at their Annual Exhibit for the outside Society having the greatest number of members exhibiting at their show and there will be quite a few going over to get this cup at their meeting on Friday evening, December 7th.

Application for membership from Andrew L. Wright, 11 St. Francis Place, Brooklyn, N. Y.

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Interesting Fish for the Aquarium

By C. J. HEEDE

(Continued from November issue)

Do not overstock and do not keep more tanks on hand than you can possibly take care of; even if a tank is well balanced a daily inspection and care is necessary; remove the remnants of food and decayed animal and plant matter quite frequently.

As regards the feeding of the fishes a great many different opinions exist. I believe in feeding in the Spring, Summer and Fall with finely chopped up earth worms, live daphnia and enchytraen or white worms. In the Winter with raw, finely scraped beef, boiled and well dried calf or sheep liver, scraped fine when fed to the fishes, also the white worms mentioned above. The young fishes must, of course, be fed in a somewhat different way. Those that have been newly born or newly hatched require infusoria, the spawning fishes much more so than the live bearing. Another good suitable food is the hard boiled yolk of the egg, the inside of meal worms squeezed out-into the water, very small daphnia, finely scraped beef, all very sparingly given.

In regard to plant growth in tanks, I must say that plants are a necessity for an aquarium, animal life absorbs oxygen and thrown off carbon dioxide, plant life on the contrary absorbs carbonic acid gas and gives off oxygen, what one exhales the other requires, what would suffocate the one if not removed will cause the other to thrive. This is the universal balancing action of nature and applies to everything alive.

The best plants for the tank are those which come from Southern

countries, they grow well and keep green all the year round, very few local plants will show up to advantage during the winter months; select only the kinds which grow well, thus producing oxygen both in Winter and Summer. The following varieties are the most desirable: Sagittaria, Valisneria, Cabomba, Myriophyllum, Hetheranthea, Ludwigia, Pillularia, Fontinalis. The last two are domestic and appear best in the Fall. The last named is very suitable in aquaria for spawning fishes kept for breeding purposes.

It is also necessary to keep scavengers in the aquarium for the purpose of removing and absorbing refuse, remnants of food, etc. For this purpose snails and tadpoles, principally those of the Gobiidae family, are desirable and some varieties of fishes. The best snails are the Ram or Post-horns and especially the beautiful Planorbis Corneus Rubra or Red Snail, the latter being of the spawning variety, their eggs being placed in a jelly like substance on the underpart of leaves of plants and against the glass of the tank. The live Bearing Paludina snails, including the Potomac and Japanese varieties as a rule are very useful in keeping the gravel bottom of the tank clean. A snail which should never be kept in the tank is the common stagnant water snail, they are short horned, trumpet formed in shape and will mercilessly destroy plant growth.

All snails are very useful in the tank, they absorb all parasite plant growth, they will keep the leaves of

the plants clean, and thereby indirectly produce the necessary oxygen for the fishes. Dirty plants in the tank look bad and will not produce oxygen enough for the welfare of the fishes.

Many of the above mentioned fishes are vegetarians or herbivorous, they will keep their tank in good clean condition even without snails, because they feed extensively on the parasite plant growth, algae and loose particles of plants. An aquarium with flesh eating or carnivorous fishes is always more difficult to keep clean and attractive looking.

In regards to shape of tanks, select one that is about one third longer than its width, this proportion gives a proper form and will allow room for gravel and sufficient room for plants.

Concerning the temperature of tank water, most fishes will thrive well in an ordinary living room in Winter and Summer, newly imported tropical fishes require higher temperatures, especially for breeding, but exotic or domesticated fishes are less tender. Fishes from temperate zones are, of course, not in need of high temperatures but thrive best in cool shaded locations.

I have here in a simple way related some experiences in keeping fancy fishes, and hope that most of you will have benefited by the reading of this article.

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(Concluded from Page 72, Col. 2.)

oven like bread. These might be expected to be free of worms, but usually such is not the case. I have several times tried to gently roast wormy fishfoods on pie plates in a gas oven. If the heat were sufficient to kill the larvæ and eggs, it took the life and flavor out of the food.

Last Fall I prepared a bushel of food—enough to last me several years. One of the ingredients was puppy biscuit, which is particularly subject to becoming wormy. I stored the food in a large tin in a coal cellar, and as soon as zero weather arrived, placed it out-doors. Each very cold day I poured it back and forth into a tub several times, so as to get it thoroughly refrigerated. After about a week it was poured in quart mason jars, the tops secured, and placed out-doors for another week. If worms appeared it would be easy to see evidence of them through the glass, but after a year there is not now the slightest sign of this trouble.

After a stock of fishfood has been well sterilized, it is best to place several weeks' supply at a time in a small box for daily feeding. A few worms getting into this will do no particular damage, as it is used up before they can do much breeding.

Some kinds of worms form a cocoon of the fishfood about themselves. Several of the larger fishes, such as the Chanchitos or goldfish, enjoy eating worms, cocoon and the attached fishfood as one morsel.

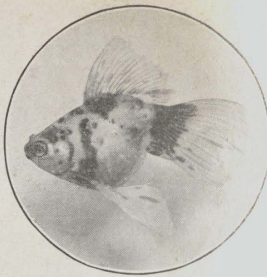
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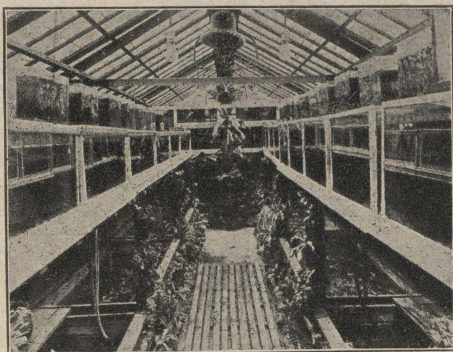
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